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HIWASSEE LAKE, CHEROKEE COUNTY, NORTH CAROLINA

Pacific Northwest Environmental Research Laboratory

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16. ABSTRACT
Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivded according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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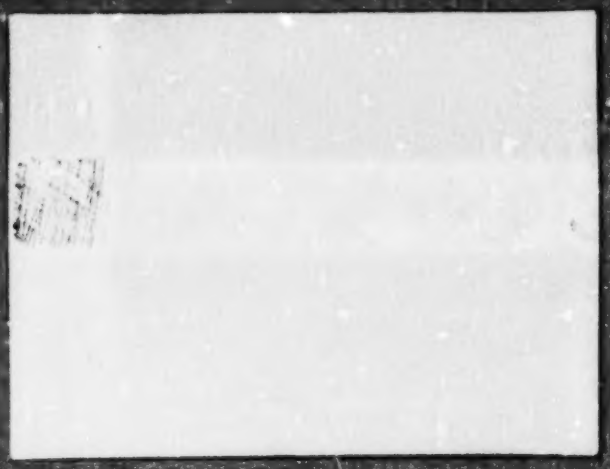

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REPORT
ON
HIWASSEE LAKE
CHEROKEE COUNTY
NORTH CAROLINA
EPA REGION IV
WORKING PAPER No. 382

WITH THE COOPERATION OF THE

NORTH CAROLINA DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES

AND THE

NORTH CAROLINA NATIONAL GUARD

JUNE, 1975

CONTENTS

	Page
Foreword	ii
List of North Carolina Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	4
III. Lake Water Quality Summary	5
IV. Nutrient Loadings	10
V. Literature Reviewed	16
VI. Appendices	17

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the North Carolina Department of Natural and Economic Resources for professional involvement and to the North Carolina National Guard for conducting the tributary sampling phase of the Survey.

Lewis R. Martin, Director of the Division of Environmental Management; Darwin L. Coburn, Chief of the Water Quality Section; and Julian R. Taylor, Supervisor of the Monitoring Program Unit; provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

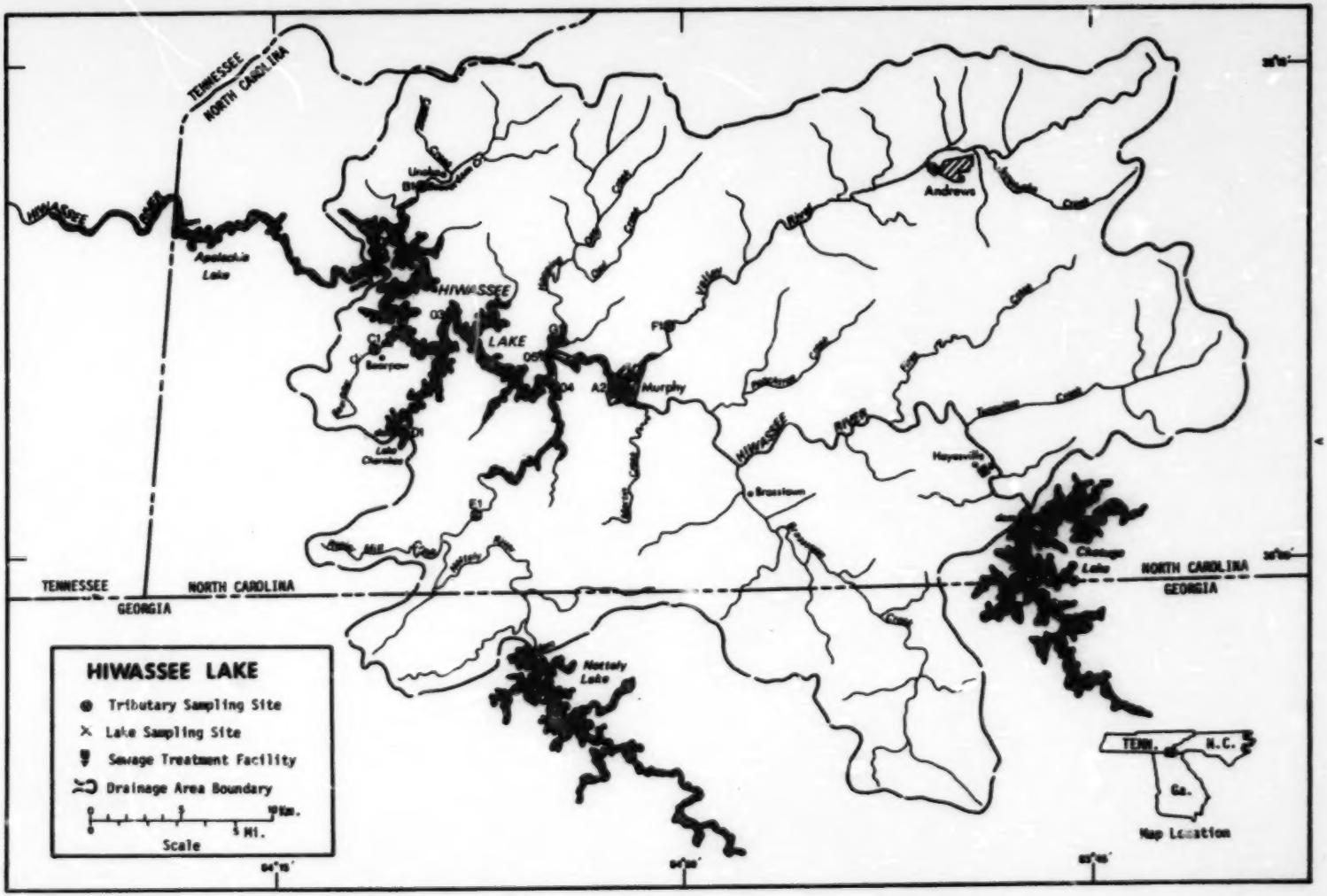
Major General William M. Buck, formerly Adjutant General of North Carolina, and Project Officer Colonel Arthur J. Bouchard, who directed the volunteer efforts of the North Carolina National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF NORTH CAROLINA

LAKE NAME	COUNTY
Badin	Montgomery, Stanly
Blewett Falls	Anson, Richmond
Chatuge	Clay, NC; Towns, GA
Fontana	Graham, Swain
Hickory	Alexander, Caldwell, Catawba
High Rock	Davidson, Rowan
Hiwassee	Cherokee
James	Burke, McDowell
John H. Kerr (Nut Bush Creek)	Granville, Vance, Warren, NC; Halifax, Mecklenburg, VA
Junaluska	Haywood
Lookout Shoals	Alexander, Catawba, Iredell
Mountain Island	Gaston, Mecklenburg
Norman	Catawba, Iredell, Lincoln, Mecklenburg
Rhodhiss	Burke, Caldwell
Santeetlah	Graham
Tillery	Montgomery, Stanly
Waccamaw	Columbus
Waterville	Haywood
Wylie	Gaston, Mecklenburg, NC; York, SC


TENNESSEE
NORTH CAROLINA
HIWASSEE LAKE
Apalachia Lake
HIWASSEE LAKE
Andrews
Murphy
Hayesville
Brasstown
Chatuge Lake
NORTH CAROLINA
GEORGIA
TENNESSEE
NORTH CAROLINA
GEORGIA
Nottely Lake
TENN.
N.C.
Ga.
Map Location
HIWASSEE LAKE
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
Scale

HIWASSEE LAKE

STORET NO. 3707

I. CONCLUSIONS

A. Trophic Condition:

Survey data show that Hiwassee Lake is mesotrophic. Of the 16 North Carolina lakes and reservoirs sampled in 1973, it ranked fourth in overall trophic quality based on an index of six water quality parameters*. Two of the lakes had less median total phosphorus, five had less and one had the same median dissolved phosphorus, three had less median inorganic nitrogen, eight had less mean chlorophyll a, and only two had a greater Secchi disc transparency. Depression of dissolved oxygen with depth occurred at station 1 in August and October and at station 2 in August.

During their visits to the lake, Survey limnologists did not observe any nuisance conditions. However, one of the June phytoplankton samples indicates a near-bloom of blue-green algae (see page 7).

B. Rate-Limiting Nutrient:

The algal assay results indicate Hiwassee Lake was phosphorus limited at the time the samples were collected (06/01-02/73). The lake data indicate phosphorus limitation at all sampling times;

* See Appendix A.

i.e., the mean N/P ratios were 14/1 or greater at all sampling stations and times, and phosphorus limitation would be expected.

C. Nutrient Controllability:

1. Point sources--Point sources contributed 9.6% of the total phosphorus load to Hiwassee Lake during the sampling year. The Murphy wastewater treatment plant contributed 5.2%, the Andrews plant contributed 3.5%, and the Hayesville plant contributed 1.1% of this total.

The present loading rate of 1.8 $g/m^2/yr$ is slightly above the rate proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic rate (see page 15). A high degree of phosphorus control at the listed point sources should ensure the existing quality of Hiwassee Lake.

2. Non-point sources--The phosphorus contribution of non-point sources amounted to 90.2% of the total reaching the lake. The gaged tributaries contributed a total of 82.6% and ranged from 36.3% (Hiwassee River) to 1.1% (Bearpaw Creek). The ungaged tributaries were estimated to have contributed 6.6% of the total.

The mean of the phosphorus export rates of the Hiwassee Lake tributaries was a relatively low 18 $kg/km^2/yr$ (see page 14). The somewhat higher rate of Bearpaw Creek (37 $kg/km^2/yr$) may be the result of an error in the estimate of the size of the drainage area since no point sources are known to impact the creek.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 25.41 kilometers^2.
2. Mean depth: 21.3 meters.
3. Maximum depth: >67.4 meters.
4. Volume: 541 x 10^6 m^3.
5. Mean hydraulic retention time: 116 days (based on outlet flow).

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Hiwassee River	1.090.4	23.3
Beaverdam Creek	66.8	1.6
Bearpaw Creek	14.0	0.3
Lake Cherokee outlet	42.0	1.0
Nottely River	704.5	13.3
Valley River	295.3	7.2
Hanging Dog Creek	105.7	2.6
Minor tributaries & immediate drainage -	163.0	4.5
Totals	2,481.7	53.8

2. Outlet -

Hiwassee River	2,507.1**	54.0

† Table of metric conversions--Appendix B.
†† Park, 1974.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.

C. Precipitation*:

1. Year of sampling: 178.7 centimeters.

2. Mean annual: 140.7 centimeters.

* See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Hiwassee Lake was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from six stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, two 18.9-liter depth-integrated samples were composited for algal assays (stations 1, 2, and 3 were combined, and stations 4, 5, and 6 were combined). Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 67.4 meters at station 1, 54.6 meters at station 2, 29.9 meters at station 3, 17.7 meters at station 4, 16.5 meters at station 5, and 24.1 meters at station 6.

The lake sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR HIWASSEE LAKE
STORET CODE 3707

PARAMETER	1ST SAMPLING (6/ 1/73) 6 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (8/23/73) 6 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/26/73) 6 SITES RANGE	MEAN	MEDIAN
TEMP (C)	7.5 - 22.7	16.3	16.8	11.1 - 27.3	22.3	21.9	6.4 - 20.7	18.6	19.6
DISS OXY (MG/L)	7.0 - 10.0	8.4	8.4	0.8 - 9.8	6.2	6.1	1.0 - 8.8	6.5	7.0
CNDCTVY (MCROMO)	50. - 50.	50.	50.	23. - 65.	39.	27.	21. - 27.	23.	23.
PH (STAND UNITS)	6.3 - 8.5	7.2	7.0	5.6 - 8.9	6.8	6.5	6.4 - 7.1	6.7	6.7
TOT ALK (MG/L)	10. - 12.	10.	10.	10. - 18.	11.	10.	10. - 17.	11.	10.
TOT P (MG/L)	0.009 - 0.097	0.029	0.021	0.006 - 0.060	0.016	0.012	0.006 - 0.047	0.015	0.012
ORTHO P (MG/L)	0.003 - 0.023	0.008	0.007	0.003 - 0.016	0.007	0.006	0.005 - 0.014	0.008	0.008
NO2+NO3 (MG/L)	0.050 - 0.300	0.185	0.200	0.060 - 0.320	0.160	0.180	0.040 - 0.340	0.090	0.070
AMMONIA (MG/L)	0.040 - 0.140	0.081	0.060	0.030 - 0.290	0.081	0.070	0.040 - 0.350	0.092	0.080
KJEL N (MG/L)	0.200 - 0.600	0.229	0.200	0.200 - 0.600	0.323	0.300	0.200 - 0.500	0.282	0.300
INORG N (MG/L)	0.100 - 0.440	0.266	0.270	0.100 - 0.400	0.241	0.250	0.100 - 0.490	0.182	0.170
TOTAL N (MG/L)	0.250 - 0.700	0.415	0.420	0.310 - 0.740	0.482	0.475	0.250 - 0.640	0.372	0.350
CHLRPYL A (UG/L)	2.8 - 9.9	5.4	4.6	5.9 - 12.3	7.4	6.2	2.7 - 5.6	4.2	3.9
SECCHI (METERS)	0.7 - 2.0	1.2	1.0	1.8 - 1.9	1.8	1.8	1.7 - 5.5	3.0	2.8

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal units per ml
06/01/73 (stations 1-3)	1. Oscillatoria	8,351
	2. Synedra	4,342
	3. Blue-green coccoid cells	1,586
	4. Tabellaria	941
	5. Cyclotella	251
	Other genera	564
	Total	16,035
06/02/73 (stations 4-6)	1. Synedra	1,126
	2. Tabellaria	270
	3. Green coccoid cells	158
	4. Flagellates	113
	5. Cyclotella	68
	Other genera	157
	Total	1,892
08/23/73	1. Anabaena	2,226
	2. Gleocystis	268
	3. Green coccoid cells	167
	4. Flagellates	151
	5. Mallomonas	134
	Other genera	352
	Total	3,298
10/26/73	1. Cyclotella	615
	2. Melosira	259
	3. Flagellates	224
	4. Anabaena	160
	5. Asterionella	85
	Other genera	289
	Total	1,632

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
06/01/73	01	7.8
	02	9.9
	03	2.9
	04	3.6
	05	2.8
	06	5.7
08/23/73	01	12.3
	02	7.8
	03	6.4
	04	6.0
	05	5.9
	06	6.0
10/26/73	01	2.7
	02	3.9
	03	3.9
	04	5.2
	05	3.8
	06	5.6

C. Limiting Nutrient Study:

1. Stations 1, 2, and 3 -

a. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.008	0.144	0.2
0.050 P	0.058	0.144	1.8
0.050 P + 1.0 N	0.058	1.144	2.6
1.0 N	0.008	1.144	0.1

2. Stations 4, 5, and 6 -

a. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.008	0.168	0.1
0.050 P	0.058	0.168	4.1
0.050 P + 1.0 N	0.058	1.168	18.5
1.0 N	0.008	1.168	0.1

b. Filtered and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	<0.005	0.230	0.2
0.050 P	<0.055	0.230	3.8
0.050 P + 1.0 N	<0.055	1.230	17.1
1.0 N	<0.005	1.230	0.2

3. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential primary productivity of Hiwassee Lake was low at the time the samples were collected. The results also indicate the lake was phosphorus limited at that time. Significant increases in yields occurred when orthophosphorus was added, but there were no yield responses when only nitrogen was added.

The lake data indicate phosphorus limitation in August and October as well; i.e., the mean inorganic nitrogen to orthophosphorus ratios were 14 to 1 or greater at all sampling stations.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the North Carolina National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of January and February when two samples were collected. Sampling was begun in March, 1973, and was completed in February, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the North Carolina District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in kg/km^2/year, at stations B-1, C-1, D-1, E-1, and G-1 and multiplying the means by the ZZ area in km^2.

The operators of the wastewater treatment plants at Andrews and Hayesville did not participate, and the operator of the Murphy wastewater treatment plant provided only one effluent sample and corresponding flow data. Therefore, the nutrient loads from these sources were estimated at 1.134 kg P and 3.401 kg N/capita/yr.

* See Working Paper No. 175.

A. Waste Sources:

1. Known municipal* -

Name	Pop. Served**	Treatment	Mean Flow (m^3/d)***	Receiving Water
Andrews	1,384	Imhoff tank	523.8	Valley River
Hayesville	428	act. sludge	162.0	Hiwassee River
Murphy	2,082	act. sludge	788.0	Hiwassee Lake

2. Known industrial - None

* Anonymous, 1971.
** 1970 Census.
*** Estimated at 0.3785 m^3/capita/day.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Hiwassee River	16,465	36.3
Beaverdam Creek	725	1.6
Bearpaw Creek	520	1.1
Lake Cherokee outlet	675	1.5
Nottely River	13,105	28.9
Valley River	4,885	10.8
Hanging Dog Creek	1,080	2.4
b. Minor tributaries & immediate drainage (non-point load) -	3,030	6.6
c. Known municipal STP's -		
Andrews	1,570	3.5
Hayesville	485	1.1
Murphy	2,360	5.2
d. Septic tanks* -	25	<0.1
e. Known industrial - None	-	-
f. Direct precipitation** -	445	1.0
Total	45,370	100.0

2. Outputs -

Lake outlet - Hiwassee River 25,000

3. Net annual P accumulation - 20,370 kg.

* Estimate based on 82 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
Hiwassee River	406,165	42.5
Beaverdam Creek	16,575	1.7
Bearpaw Creek	5,560	0.6
Lake Cherokee outlet	19,000	2.0
Nottely River	262,440	27.5
Valley River	91,635	9.6
Hanging Dog Creek	49,440	5.2
b. Minor tributaries & immediate drainage (non-point load) -	63,180	6.6
c. Known municipal STP's -		
Andrews	4,705	0.5
Hayesville	1,455	0.2
Murphy	7,080	0.7
d. Septic tanks* -	875	<0.1
e. Known industrial - None	-	-
f. Direct precipitation** -	27,435	2.9
Total	955,545	100.0

2. Outputs -

Lake outlet - Hiwassee River 1,013,130

3. Net annual N loss - 57,785 kg.

* Estimate based on 82 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
Hiwassee River	15	372
Beaverdam Creek	11	248
Bearpaw Creek	37	397
Lake Cherokee outlet	16	452
Nottely River	19	373
Valley River	17	310
Hanging Dog Creek	10	468

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	1.79	0.80	37.6	loss*

Vollenweider loading rates for phosphorus ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Hiwassee Lake:

"Dangerous" (eutrophic rate)	1.56
"Permissible" (oligotrophic rate)	0.78

* There was an apparent loss of nitrogen during the sampling year. This may have been due to nitrogen fixation in the lake, solubilization of previously sedimented nitrogen, recharge with nitrogen-rich ground water, or unknown and unsampled point sources discharging directly to the lake. Whatever the cause, a similar nitrogen loss has occurred at Shagawa Lake, Minnesota, which has been intensively studied by EPA's National Eutrophication and Lake Restoration Branch (Malueg et al., 1975).

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	3719	LAKE WACCAMAW	534
2	3716	SANTEELAH LAKE	446
3	3711	MOUNTAIN ISLAND LAKE	419
4	3707	HIWASSEE LAKE	414
5	3704	FONTANA LAKE	392
6	3713	LAKE NORMAN	346
7	3708	LAKE JAMES	334
8	3710	LOOKOUT SHOALS	327
9	3715	RHODHISS LAKE	296
10	3705	LAKE HICKORY	283
11	3717	LAKE TILLERY	246
12	3709	LAKE JUNALUSKA	220
13	3702	BLEWETT FALLS LAKE	200
14	3718	WATERVILLE RESERVOIR	140
15	3701	BADIN LAKE	124
16	3706	HIGH ROCK LAKE	76

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
3701	BADIN LAKE	33 (5)	7 (1)	27 (4)	27 (4)	3 (0)	27 (4)	124
3702	BLEWETT FALLS LAKE	7 (1)	13 (2)	7 (1)	73 (11)	93 (14)	7 (1)	200
3704	FONTANA LAKE	100 (15)	33 (5)	93 (14)	100 (15)	3 (0)	63 (9)	392
3705	LAKE HICKORY	27 (4)	60 (9)	53 (8)	13 (2)	80 (12)	50 (7)	283
3706	HIGH ROCK LAKE	13 (2)	20 (3)	0 (0)	0 (0)	23 (2)	20 (3)	76
3707	HIWASSEE LAKE	87 (13)	80 (12)	87 (13)	47 (7)	50 (7)	63 (9)	414
3708	LAKE JAMES	60 (9)	87 (13)	80 (12)	7 (1)	23 (2)	77 (11)	334
3709	LAKE JUNALUSKA	47 (7)	27 (4)	43 (6)	20 (3)	50 (7)	33 (5)	220
3710	LOOKOUT SHOALS	53 (8)	47 (7)	60 (9)	67 (10)	60 (9)	40 (6)	327
3711	MOUNTAIN ISLAND LAKE	73 (11)	73 (11)	43 (6)	53 (8)	87 (13)	90 (13)	419
3713	LAKE NORMAN	67 (10)	53 (8)	73 (11)	40 (6)	23 (2)	90 (13)	346
3715	RHODHISS LAKE	20 (3)	67 (10)	33 (5)	93 (14)	70 (10)	13 (2)	296
3716	SANTEELAH LAKE	93 (14)	93 (14)	100 (15)	60 (9)	23 (2)	77 (11)	446
3717	LAKE TILLERY	40 (6)	40 (6)	13 (2)	33 (5)	70 (10)	50 (7)	246
3718	WATERVILLE RESERVOIR	0 (0)	0 (0)	20 (3)	80 (12)	40 (6)	0 (0)	140
3719	LAKE WACCAMAW	80 (12)	100 (15)	67 (10)	87 (13)	100 (15)	100 (15)	534

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
3701	BADIN LAKE	0.042	0.680	466.750	7.190	14.900	0.012
3702	BLEWETT FALLS LAKE	0.090	0.655	476.889	4.167	10.800	0.034
3704	FONTANA LAKE	0.011	0.550	392.650	3.438	14.900	0.007
3705	LAKE HICKORY	0.047	0.320	461.000	7.275	13.400	0.008
3706	HIGH ROCK LAKE	0.090	0.580	477.454	14.283	14.800	0.017
3707	HIWASSEE LAKE	0.015	0.240	420.555	5.678	14.200	0.007
3708	LAKE JAMES	0.020	0.160	428.866	7.660	14.800	0.006
3709	LAKE JUNALUSKA	0.031	0.560	462.000	7.233	14.200	0.009
3710	LOOKOUT SHOALS	0.026	0.370	459.167	4.200	13.800	0.008
3711	MOUNTAIN ISLAND LAKE	0.018	0.270	462.000	5.580	12.800	0.005
3713	LAKE NORMAN	0.019	0.330	446.667	5.807	14.800	0.005
3715	RHODHISS LAKE	0.061	0.305	462.111	3.578	13.600	0.019
3716	SANTEELAH LAKE	0.011	0.160	366.400	5.360	14.800	0.006
3717	LAKE TILLERY	0.040	0.470	468.600	6.827	13.600	0.008
3718	WATERVILLE RESERVOIR	0.103	0.860	468.333	3.817	14.400	0.041
3719	LAKE WACCAMAW	0.018	0.120	455.667	3.583	9.800	0.004

APPENDIX B

CONVERSIONS FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR NORTH CAROLINA 10/21/75

LAKE CODE 3707 HIWASSEE LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ MI) 968.00

TRIBUTARY	SUB-DRAINAGE AREA(SQ MI)	NORMALIZED FLOWS(CFS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
3707A1	968.00	2074.00	2273.00	1568.00	829.00	1303.00	1746.00	1877.00	2076.00	2082.00	2251.00	2243.00	2569.00	1906.58
3707A2	421.00	900.00	1050.00	970.00	1110.00	935.00	910.00	930.00	855.00	710.00	385.00	375.00	775.00	824.11
3707B1	25.00	65.00	105.00	100.00	82.00	59.00	42.00	40.00	31.00	23.00	21.00	34.00	66.00	57.07
3707C1	5.39	18.00	21.00	21.00	17.00	12.00	8.70	8.40	6.60	4.80	4.40	7.00	14.00	11.86
3707D1	16.20	54.00	64.00	64.00	52.00	37.00	26.00	25.00	20.00	14.00	13.00	21.00	41.00	35.77
3707E1	272.00	510.00	485.00	455.00	545.00	590.00	580.00	510.00	570.00	585.00	220.00	295.00	410.00	469.44
3707F1	114.00	385.00	455.00	450.00	345.00	260.00	185.00	175.00	140.00	100.00	92.00	150.00	290.00	252.05
3707G1	40.00	135.00	160.00	160.00	130.00	93.00	66.00	64.00	50.00	36.00	33.00	53.00	105.00	90.05
3707Z2	72.00	240.00	290.00	285.00	230.00	165.00	115.00	115.00	89.00	65.00	60.00	95.00	185.00	160.49

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 968.00
SUM OF SUB-DRAINAGE AREAS = 967.99

TOTAL FLOW IN = 22867.89
TOTAL FLOW OUT = 22891.00

MEAN MONTHLY FLOWS AND DAILY FLOWS(CFS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3707A1	3	73	1620.00	24	2450.00				
	4	73	710.00	28	380.00				
	5	73	3460.00	26	5280.00				
	6	73	3500.00	28	3810.00				
	7	73	2520.00	28	2290.00				
	8	73	2460.00	31	2630.00				
	9	73	2460.00						
	10	73	2180.00	1	2000.00				
	11	73	2690.00	3	2390.00				
	12	73	3020.00	8	2330.00				
	1	74	5980.00	5	6150.00	19	6580.00		
	2	74	5270.00	9	7070.00	23	5590.00		
3707A2	3	73	1340.00	24	1300.00				
	4	73	1230.00	28	2710.00				
	5	73	2020.00	25	2300.00				
	6	73	1680.00	29	1540.00				
	7	73	1080.00	28	950.00				
	8	73	1050.00						
	9	73	850.00	2	620.00				
	10	73	450.00	1	385.00				
	11	73	840.00	3	530.00				
	12	73	1540.00	8	1450.00				
	1	74	2520.00	4	3540.00	19	2270.00		
	2	74	2320.00	9	2430.00	23	2430.00		

TRIBUTARY FLOW INFORMATION FOR NORTH CAROLINA 10/21/75

LAKE CODE 3707 HIWASSEE LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CFS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3707B1	3	73	100.00	24	95.00				
	4	73	85.00	28	240.00				
	5	73	90.00	25	70.00				
	6	73	65.00	29	60.00				
	7	73	48.00	28	45.00				
	8	73	40.00						
	9	73	26.00	2	25.00				
	10	73	18.00	1	33.00				
	11	73	35.00	3	29.00				
	12	73	90.00	8	55.00				
	1	74	200.00	4	550.00	19	120.00		
	2	74	175.00	9	225.00	23	175.00		
3707C1	3	73	24.00	24	28.00				
	4	73	21.00	28	95.00				
	5	73	22.00	26	14.00				
	6	73	14.00	28	15.00				
	7	73	10.00	28	9.50				
	8	73	8.50	31	5.70				
	9	73	5.50						
	10	73	4.30	1	6.40				
	11	73	8.20	3	4.20				
	12	73	20.00	8	12.00				
	1	74	40.00	5	120.00	19	25.00		
	2	74	35.00	9	45.00	23	37.00		
3707D1	3	73	75.00	24	60.00				
	4	73	64.00	28	155.00				
	5	73	67.00	26	45.00				
	6	73	42.00	28	40.00				
	7	73	30.00	28	28.00				
	8	73	25.00	31	17.00				
	9	73	16.00						
	10	73	12.00	1	19.00				
	11	73	23.00	3	13.00				
	12	73	50.00	8	37.00				
	1	74	130.00	5	350.00	19	75.00		
	2	74	110.00	9	140.00	23	110.00		
3707E1	3	73	550.00	24	510.00				
	4	73	440.00	28	540.00				
	5	73	750.00	26	1130.00				
	6	73	1050.00	28	1120.00				
	7	73	675.00	28	870.00				
	8	73	775.00	31	980.00				
	9	73	600.00						
	10	73	535.00	1	560.00				
	11	73	670.00	3	460.00				
	12	73	950.00	8	960.00				
	1	74	1250.00	5	2180.00	19	960.00		
	2	74	1350.00	9	1750.00	23	1150.00		

TRIBUTARY FLOW INFORMATION FOR NORTH CAROLINA 10/21/75

LAKE CODE 3707 HIWASSEE LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CFS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
3707F1	3	73	570.00	24	460.00				
	4	73	495.00	28	1180.00				
	5	73	520.00	25	360.00				
	6	73	325.00	29	280.00				
	7	73	235.00	28	220.00				
	8	73	190.00						
	9	73	125.00	2	110.00				
	10	73	90.00	1	135.00				
	11	73	165.00	2	95.00				
	12	73	420.00	8	260.00				
	1	74	950.00	4	2500.00	19	530.00		
	2	74	800.00	9	1000.00	23	780.00		
3707G1	3	73	165.00	24	150.00				
	4	73	150.00	23	380.00				
	5	73	160.00	25	115.00				
	6	73	105.00	29	90.00				
	7	73	75.00	28	72.00				
	8	73	63.00						
	9	73	41.00	2	39.00				
	10	73	30.00	1	50.00				
	11	73	60.00	2	34.00				
	12	73	150.00	8	92.00				
	1	74	325.00	4	890.00	19	190.00		
	2	74	250.00	9	360.00	23	280.00		
3707Z2	3	73	330.00						
	4	73	290.00						
	5	73	300.00						
	6	73	190.00						
	7	73	135.00						
	8	73	110.00						
	9	73	73.00						
	10	73	55.00						
	11	73	90.00						
	12	73	270.00						
	1	74	500.00						
	2	74	350.00						

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/10/20

370701
35 09 06.0 084 10 38.0
MIDASSEE LAKE
37039 NORTH CAROLINA

11EPALES
3

2111202
0225 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT K JEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/01	10	15 0000	22.1		72	50K	8.00	11	0.050	0.200	0.050	0.003
	10	15 0006	21.5	9.6		50K	8.50	12	0.040	0.200K	0.050	0.004
	10	15 0015	19.3	10.0		50K	8.10	11	0.040	0.200	0.060	0.007
	10	15 0030	17.2	8.8		50K	7.80	12	0.040	0.200	0.110	0.010
	10	15 0050	15.7	8.4		50K	7.60	10	0.070	0.200K	0.140	0.003
	10	15 0075	14.9	8.4		50K	6.30	10	0.070	0.200K	0.160	0.003
	10	15 0100	14.2	8.0		50K	6.60	10K	0.070	0.200K	0.160	0.004
	10	15 0125	13.4	8.0		50K	6.80	10K	0.040	0.200K	0.180	0.006
	10	15 0150	12.4	8.4		50K	6.80	10K	0.040	0.200K	0.200	0.006
	10	15 0175	11.4	8.2		50K	6.80	10K	0.090	0.200K	0.240	0.007
	10	15 0200	9.8	7.0		50K	6.80	10	0.090	0.200K	0.260	0.007
	10	15 0221	7.5	7.2		50K	6.80	10K	0.080	0.200K	0.250	0.007
73/08/23	09	15 0000	26.6		70	27	8.90	10K	0.130	0.600	0.140	0.010
	09	15 0005	26.5	9.0		26	8.20	10K	0.100	0.300	0.100	0.007
	09	15 0015	24.2	9.8		24	6.40	10K	0.160	0.400	0.090	0.012
	09	15 0025	22.3	6.4		23	6.20	10K	0.180	0.300	0.060	0.006
	09	15 0050	20.6	5.9		23	6.20	10K	0.110	0.300	0.090	0.005
	09	15 0075	19.8	5.4		24	6.10	10K	0.050	0.200K	0.190	0.003
	09	15 0100	19.2	5.2		23	5.90	10K	0.040	0.200K	0.220	0.004
	09	15 0125	18.6	5.2		24	5.90	10K	0.050	0.200K	0.230	0.004
	09	15 0150	17.7	4.6		23	5.70	10K	0.060	0.200K	0.270	0.004
	09	15 0175	16.8	2.6		25	5.70	10K	0.070	0.300	0.290	0.007
	09	15 0190	11.1	4.5		23	5.60	10K	0.030	0.200	0.320	0.007
73/10/26	12	47 0000	20.6		216	22	7.00	12	0.060	0.200	0.140	0.009
	12	47 0015	20.5	5.4		22	6.80	10	0.050	0.200K	0.140	0.007
	12	47 0040	20.4	5.2		22	6.70	10K	0.060	0.200K	0.120	0.007
	12	47 0070	20.2	3.6		24	6.60	10	0.040	0.200K	0.210	0.008
	12	47 0120	19.3	3.0		27	6.50	12	0.150	0.300	0.140	0.008
	12	47 0155	18.4	4.0		26	6.60	14	0.180	0.400	0.080	0.008
	12	47 0180	8.9	3.4		21	6.40	12	0.040	0.200K	0.340	0.008
	12	47 0210	6.4	1.0		26	6.40	17	0.350	0.500	0.140	0.006

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370701
35 09 06.0 084 10 38.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES 2111202
3 0225 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/01	10 15	0000	0.018	7.8
	10 15	0006	0.017	
	10 15	0015	0.021	
	10 15	0030	0.021	
	10 15	0050	0.014	
	10 15	0075	0.014	
	10 15	0100	0.015	
	10 15	0125	0.015	
	10 15	0150	0.013	
	10 15	0175	0.014	
	10 15	0200	0.016	
	10 15	0221	0.015	
73/08/23	09 15	0000	0.013	12.3
	09 15	0005	0.012	
	09 15	0015	0.012	
	09 15	0025	0.010	
	09 15	0050	0.007	
	09 15	0075	0.006	
	09 15	0100	0.007	
	09 15	0125	0.007	
	09 15	0150	0.008	
	09 15	0175	0.012	
	09 15	0190	0.010	
73/10/20	12 47	0000	0.007	2.7
	12 47	0015	0.007	
	12 47	0040	0.006	
	12 47	0070	0.007	
	12 47	0120	0.013	
	12 47	0155	0.019	
	12 47	0180	0.009	
	12 47	0210	0.009	

STORET RETRIEVAL DATE 75/10/20

370702
35 08 16.0 084 10 12.0
MISSEE LAKE
37039 NORTH CAROLINA

11EPALES
3

2111202
0183 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/01	14 30	0000	22.7		78	50K	8.30	10K	0.080	0.400	0.100	0.005
	14 30	0006	21.9	9.6		50K	8.10	10K	0.050	0.200K	0.050	0.006
	14 30	0015	19.8	9.8		50K	7.70	10K	0.060	0.200	0.080	0.006
	14 30	0030	17.2	7.8		50K	7.40	10K	0.140	0.200	0.280	0.008
	14 30	0050	16.2	7.9		50K	7.20	10K	0.100	0.200K	0.230	0.005
	14 30	0075	15.2	8.0		50K	7.20	10	0.070	0.200K	0.200	0.007
	14 30	0100	14.1	8.0		50K	7.10	10	0.080	0.200K	0.210	0.008
	14 30	0125	13.4	8.0		50K	7.00	11	0.080	0.200K	0.220	0.006
	14 30	0150	12.1	7.4		50K	6.90	11	0.100	0.200K	0.240	0.007
	14 30	0179	11.3	7.0		50K	6.90	10	0.110	0.200K	0.240	0.005
73/08/23	10 00	0000	26.5		70	24	8.70	10K	0.120	0.600	0.140	0.006
	10 00	0005	26.3	8.6		26	8.00	10K	0.080	0.500	0.090	0.005
	10 00	0015	23.8	6.4		27	6.50	11	0.060	0.300	0.120	0.004
	10 00	0025	22.2	5.0		27	5.90	11	0.070	0.300	0.180	0.003
	10 00	0050	20.6	5.0		27	6.30	12	0.090	0.200	0.230	0.004
	10 00	0075	19.8	4.6		26	6.10	10	0.090	0.300	0.230	0.012
	10 00	0100	19.2	4.4		26	6.30	10	0.090	0.200K	0.240	0.004
	10 00	0130	18.4	3.2		27	6.10	11	0.090	0.200	0.260	0.004
	10 00	0163	17.4	0.8		38	6.40	18	0.290	0.400	0.110	0.006
73/10/26	13 25	0000	20.7		132	22	6.60	10	0.080	0.300	0.110	0.008
	13 25	0010	20.4	6.0		22	6.50	10	0.070	0.200	0.100	0.008
	13 25	0025	20.4	6.6		22	6.50	12	0.070	0.200	0.100	0.005
	13 25	0050	20.4	6.0		22	6.50	10	0.070	0.200	0.100	0.005
	13 25	0100	19.6	6.6		22	6.50	10	0.090	0.200	0.050	0.011
	13 25	0139	18.5	6.6		22	6.40	11	0.130	0.400	0.070	0.014

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370702
35 08 16.0 084 10 12.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES 2111202
3 0183 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/01	14 30	0000	0.019	9.9
	14 30	0006	0.019	
	14 30	0015	0.026	
	14 30	0030	0.076	
	14 30	0050	0.069	
	14 30	0075	0.030	
	14 30	0100	0.020	
	14 30	0125	0.021	
	14 30	0150	0.020	
	14 30	0179	0.023	
73/08/23	10 00	0000	0.011	7.8
	10 00	0005	0.014	
	10 00	0015	0.012	
	10 00	0025	0.009	
	10 00	0050	0.010	
	10 00	0075	0.013	
	10 00	0100	0.015	
	10 00	0130	0.012	
	10 00	0163	0.020	
73/10/26	13 25	0000	0.009	3.9
	13 25	0010	0.010	
	13 25	0025	0.006	
	13 25	0050	0.006	
	13 25	0100	0.014	
	13 25	0134	0.047	

STORET RETRIEVAL DATE 75/10/20

370703
35 07 37.0 084 05 31.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES
3

2111202
0102 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/01	15 35	0000	22.5		48	50K	8.10	10	0.070	0.300	0.060	0.009
	15 35	0006	21.9	9.6		50K	7.70	10K	0.120	0.200K	0.250	0.016
	15 35	0015	17.6	8.0		50K	7.80	10	0.070	0.200K	0.090	0.008
	15 35	0030	17.1	7.7		50K	7.30	10K	0.090	0.200K	0.210	0.007
	15 35	0050	16.7	8.0		50K	7.10	10K	0.130	0.200K	0.280	0.008
	15 35	0075	15.7	7.2		50K	6.90	10K	0.140	0.200K	0.300	0.010
	15 35	0098	14.2	7.0		50K	6.80	10	0.110	0.200K	0.240	0.008
73/08/23	10 30	0000	26.4		75	26	8.70	10	0.080	0.400	0.090	0.007
	10 30	0005	26.2	8.0		26	8.00	10	0.070	0.300	0.080	0.009
	10 30	0015	25.0	6.6		27	6.70	11	0.060	0.200	0.110	0.009
	10 30	0025	22.3	5.8		28	6.60	12	0.070	0.200	0.190	0.010
	10 30	0040	21.2	5.4		28	6.60	13	0.100	0.200	0.228	0.018
	10 30	0060	20.1	5.6		27	6.30	13	0.100	0.300	0.230	0.009
	10 30	0085	19.6	5.4		29	6.30	13	0.110	0.200	0.220	0.016
73/10/26	10 49	0000	20.3		113	23	6.70	10	0.080	0.200	0.060	0.006
	10 49	0010	20.2	7.0		23	6.70	10	0.080	0.200K	0.060	0.007
	10 49	0025	20.2	7.0		23	6.60	11	0.080	0.200K	0.060	0.011
	10 49	0050	19.6	7.0		23	6.60	11	0.080	0.200K	0.050	0.009
	10 49	0066	17.8	7.6		24	6.60	14	0.130	0.200	0.070	0.007

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370703
35 07 37.0 084 05 31.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES 2111202
3 0102 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/01	15 35	0000	0.026	2.9
	15 35	0006	0.060	
	15 35	0015	0.024	
	15 35	0030	0.050	
	15 35	0050	0.096	
	15 35	0075	0.047	
	15 35	0098	0.076	
73/08/23	10 30	0000	0.011	6.4
	10 30	0005	0.011	
	10 30	0015	0.011	
	10 30	0025	0.017	
	10 30	0040	0.013	
	10 30	0060	0.020	
	10 30	0085	0.020	
73/10/26	10 49	0000	0.011	3.9
	10 49	0010	0.009	
	10 49	0025	0.009	
	10 49	0050	0.010	
	10 49	0066	0.042	

STORET RETRIEVAL DATE 75/10/20

370704
35 05 01.8 084 04 29.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES
3

2111202
0062 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/02	10 00	0000	19.5		28	50K	7.20	10K	0.090	0.600	0.100	0.008
	10 00	0006	18.4	8.2		50K	7.00	10K	0.070	0.200K	0.180	0.007
	10 00	0015	16.5	8.6		50K	7.00	10K	0.050	0.200K	0.180	0.006
	10 00	0030	16.0	8.8		50K	7.00	10K	0.070	0.200K	0.200	0.007
	10 00	0045	14.4	8.8		50K	6.90	10K	0.080	0.200K	0.250	0.005
	10 00	0058	12.2	9.2		50K	6.90	10K	0.040	0.200K	0.260	0.009
73/08/22	14 55	0000	27.3		72	55	8.10	10K	0.050	0.500	0.060	0.004
	14 55	0005	27.1	8.5		50K	7.60	10K	0.060	0.300	0.060	0.004
	14 55	0015	24.8	7.6		60	6.50	10K	0.040	0.400	0.100	0.008
	14 55	0030	21.7	7.9		60	6.40	10K	0.060	0.300	0.200	0.003
	14 55	0042	20.8	7.4		60	6.90	10K	0.050	0.300	0.180	0.009
73/10/26	10 00	0000	19.5		77	23	7.00	10K	0.060	0.400	0.050	0.008
	10 00	0010	19.5	8.0		23	7.10	10K	0.060	0.300	0.040	0.005
	10 00	0020	18.7	8.2		23	6.90	10K	0.070	0.300	0.060	0.007
	10 00	0030	18.1	8.2		24	7.00	10K	0.080	0.300	0.060	0.007

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370704
35 05 01.8 084 04 29.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES 2111202
3 0062 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/02	10 00	0000	0.033	3.6
	10 00	0006	0.029	
	10 00	0015	0.011	
	10 00	0030	0.014	
	10 00	0045	0.021	
	10 00	0058	0.019	
73/08/22	14 55	0000	0.013	6.0
	14 55	0005	0.011	
	14 55	0015	0.014	
	14 55	0030	0.020	
	14 55	0042	0.024	
73/10/26	10 00	0000	0.013	5.2
	10 00	0010	0.012	
	10 00	0020	0.018	
	10 00	0030	0.022	

STORET RETRIEVAL DATE 75/10/20

370705
35 06 09.0 084 04 42.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES 2111202
3 0058 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICRUMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/02	12 50	0000	28.6		30	50K	7.40	10K	0.100	0.600	0.090	0.017
	12 50	0006	18.6	8.8		50K	7.10	10K	0.070	0.200K	0.160	0.008
	12 50	0015	16.6	8.8		50K	7.00	10K	0.080	0.200K	0.190	0.006
	12 50	0030	15.6	9.2		50K	6.90	10K	0.060	0.200K	0.180	0.008
	12 50	0042	14.6	9.2		50K	6.90	10K	0.080	0.200K	0.250	0.009
	12 50	0054	14.5	9.2		50K	6.90	10K	0.070	0.200K	0.240	0.008
73/08/22	14 25	0000	27.2		72	55	8.30	10K	0.050	0.600	0.060	0.007
	14 25	0005	26.4	8.0		55	7.60	10K	0.070	0.300	0.100	0.005
	14 25	0015	24.4	7.6		65	7.00	10K	0.050	0.300	0.120	0.003
	14 25	0030	21.4	7.6		60	6.60	10K	0.080	0.200	0.200	0.003
	14 25	0045	20.1	7.4		60	6.80	10K	0.060	0.300	0.200	0.004
73/10/26	09 38	0000	18.8		65	25	7.00	10K	0.100	0.400	0.070	0.011
	09 38	0005	18.7	8.8		24	6.90	10K	0.060	0.300	0.040	0.008
	09 38	0010	18.2	8.4		25	7.00	10K	0.080	0.300	0.050	0.008
	09 38	0015	16.4	8.6		25	6.90	10K	0.110	0.300	0.070	0.008
	09 38	0024	15.2	8.4		24	6.80	10K	0.140	0.400	0.100	0.005

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370705
35 06 09.0 084 04 42.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES 2111202
3 0058 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/02	12 50	0000	0.019	2.8
	12 50	0006	0.009	
	12 50	0015	0.013	
	12 50	0030	0.013	
	12 50	0042	0.024	
	12 50	0054	0.022	
73/08/22	14 25	0000	0.012	5.9
	14 25	0005	0.011	
	14 25	0015	0.014	
	14 25	0030	0.026	
	14 25	0045	0.052	
73/10/20	09 38	0000	0.023	3.8
	09 38	0005	0.017	
	09 38	0010	0.017	
	09 38	0015	0.020	
	09 38	0024	0.030	

STORET RETRIEVAL DATE 75/10/20

370706
35 05 47.0 084 06 10.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES
3

2111202
0003 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/06/02	13 30	0000	21.6		32	50K	7.90	10K	0.090	0.500	0.060	0.004
	13 30	0006	18.7	8.9		50K	7.30	10K	0.080	0.200K	0.150	0.004
	13 30	0015	16.9	8.4		50K	7.10	10K	0.110	0.200K	0.220	0.005
	13 30	0030	16.0	8.6		50K	7.00	10K	0.100	0.200K	0.240	0.013
	13 30	0045	15.6	8.4		50K	6.80	10K	0.110	0.200K	0.250	0.020
	13 30	0060	14.6	8.6		50K	6.90	10K	0.080	0.200K	0.250	0.023
	13 30	0079	13.4	8.8		50K	6.80	10K	0.060	0.200	0.250	0.006
73/08/22	15 20	0000	26.6		72	55	7.90	10K	0.050	0.400	0.070	0.000
	15 20	0005	26.4	8.2		55	7.60	10K	0.040	0.500	0.060	0.006
	15 20	0015	25.6	7.2		55	6.50	10K	0.050	0.300	0.080	0.014
	15 20	0025	22.4	6.2		60	6.40	10K	0.060	0.300	0.180	0.006
	15 20	0040	21.0	6.5		65	6.60	10K	0.060	0.300	0.190	0.011
	15 20	0055	20.2	5.8		65	6.20	10K	0.090	0.400	0.200	0.004
	15 20	0066	19.9	6.0		65	6.60	10	0.110	0.500	0.230	0.009
73/10/26	10 19	0000	19.9		108	23	6.80	10K	0.070	0.400	0.060	0.000
	10 19	0010	19.8	7.4		23	6.70	10K	0.060	0.300	0.050	0.007
	10 19	0020	19.8	7.4		23	6.70	10	0.060	0.200	0.050	0.006
	10 19	0030	19.7	8.0		23	6.70	10	0.070	0.400	0.040	0.013
	10 19	0045	17.6	8.0		25	6.70	11	0.110	0.300	0.090	0.012

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370706
35 05 47.0 084 06 10.0
HIWASSEE LAKE
37039 NORTH CAROLINA

11EPALES 2111202
3 00d3 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/06/02	13 30	0000	0.032	5.7
	13 30	0005	0.038	
	13 30	0015	0.032	
	13 30	0030	0.027	
	13 30	0045	0.039	
	13 30	0060	0.021	
	13 30	0079	0.021	
73/08/22	15 20	0000	0.011	6.0
	15 20	0005	0.011	
	15 20	0015	0.010	
	15 20	0025	0.014	
	15 20	0040	0.021	
	15 20	0055	0.060	
	15 20	0066	0.054	
73/10/25	10 19	0000	0.012	5.6
	10 19	0010	0.011	
	10 19	0020	0.010	
	10 19	0030	0.014	
	10 19	0045	0.026	

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 75/10/20

3707A1 LS3707A1
35 09 00.0 084 11 00.0
HIWASSEE RIVER
37057 7.5 UNAKA NC-TN
O/HIWASSE LAKE
BANK BELO HIWASSEE DAM TAKEND DOWNSTREAM
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	12 30		0.154	0.180	0.063	0.013	0.015
73/04/28	11 10		0.130	0.210	0.014	0.005K	0.010
73/05/26	15 35		0.168	0.480	0.042	0.005K	0.005K
73/06/28	20 30		0.220	1.600	0.063	0.010	0.020
73/07/28	20 00		0.220	0.690	0.016	0.008	0.010
73/08/31	15 30		0.220	0.740	0.260	0.005K	0.015
73/10/01	12 00		0.052	0.100K	0.096	0.013	
73/11/03	18 00		0.026	0.200	0.063	0.008	
73/12/08	10 30		0.136	0.400	0.036	0.008	0.015
74/01/05	09 00		0.152	0.300	0.040	0.008	0.015
74/01/19	07 00		0.184	0.200	0.044	0.008	0.030
74/02/09	09 00		0.020	0.100K	0.020	0.008	0.010
74/02/23	13 00		0.160	0.500	0.035	0.005K	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

3707A2 LS3707A2
35 05 00.0 084 02 30.0
HIWASSEE RIVER
37 7.5 MURPHY NC
1/HIWASSEE LAKE
HWY 19-64-129 BRDG AT SW EDGE OF MURPHY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	14 00		0.198	0.110	0.009	0.011	0.015
73/04/28	11 30		0.189	0.400	0.046	0.006	0.030
73/05/25	17 35		0.180	0.990	0.450	0.005K	0.015
73/06/29	16 52		0.160	0.420	0.210	0.005K	0.010
73/07/28	09 30		0.198	1.890	0.039	0.005K	0.020
73/09/02	11 04		0.132	0.160	0.042	0.007	0.010
73/10/01			0.094	0.100K	0.096	0.005K	
73/11/03	09 35		0.092	0.250	0.060	0.007	
73/12/08	11 03		0.116	0.200	0.060	0.012	0.025
74/01/04	17 30		0.208	0.200	0.016	0.008	0.025
74/01/19	06 15		0.016	0.100K	0.016	0.005K	0.020
74/02/09	13 30		0.184	0.100	0.020	0.005K	0.035
74/02/23	10 30		0.176	0.100	0.025	0.010	0.045

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370781 LS370781
35 11 30.0 084 09 30.0
BEAVERDAM CREEK
37 7.5 UNAKA NC-TN
T/HI#ASSEE LAKE
.15 MIKE SE DIRT RD 1 MI W UNAKA
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	13	20	0.066	0.140	0.013	0.007	0.015
73/04/28	10	50	0.054	0.230	0.012	0.005K	0.020
73/05/25	18	22	0.024	0.120	0.024	0.005K	0.015
73/06/29	17	45	0.028	0.380	0.016	0.005K	0.010
73/07/26	10	22	0.050	0.500	0.015	0.005K	0.020
73/09/02	12	32	0.010K	1.150	0.037	0.005K	0.010
73/10/01			0.046	0.100K	0.063	0.005K	
73/11/03	01	36	0.154	0.175	0.060	0.006	
73/12/08	15	05	0.136	0.300	0.016	0.005K	0.040
74/01/04	08	14	0.012	0.100K	0.008	0.005K	0.005
74/01/19	08	37	0.010K	0.100K	0.016	0.008	0.010
74/02/09	11	36	0.012	0.100K	0.008	0.005K	0.005K
74/02/23	13	15	0.016	0.100K	0.010	0.005K	0.005K

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

3707C1 LS3707C1
35 06 31.0 084 11 00.0
BEARPAW CREEK
37 7.5 PERSIMMON CR
T/HIWASSEE LAKE
BANK BELOW RD 1312 BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	13 10		0.189	0.130	0.009	0.007	0.030
73/04/26	10 45		0.154	0.410	0.034	0.005	0.030
73/05/26	15 15		0.126	0.870	0.032	0.020	0.260
73/06/28	20 00		0.126	1.200	0.054	0.005K	0.020
73/07/28	19 30		0.110	0.440	0.130	0.005K	0.055
73/08/31	15 00		0.126	0.360	0.095	0.005K	0.027
73/10/01	11 00		0.180	0.300	0.022	0.005K	
73/11/03	17 00		0.160	0.250	0.082	0.006	
73/12/08	09 30		0.092	0.100K	0.016	0.005K	0.005K
74/01/05	08 00		0.144	0.100	0.016	0.005K	0.025
74/01/19	07 30		0.092	0.100	0.020	0.005K	0.035
74/02/04	08 30		0.120	0.500	0.040	0.005K	0.015
74/02/23	12 30		0.148	0.100K	0.005	0.005K	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370701 LS370701
35 04 00.0 084 10 00.0
LAKE CHEROKEE OUTLET
37 7.5 PERSIMMON CR
T/HIWASSEE LAKE
UNIMPROV RD N ST RD 294.10 MI WSW MURPHY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	14 00		0.120	0.100K	0.021	0.007	0.015
73/04/28	12 15		0.120	0.240	0.024	0.007	0.035
73/05/26	16 00		0.030	0.810	0.018	0.008	0.035
73/06/28	19 30		0.021	1.150	0.027	0.005K	0.010
73/07/28	19 00		0.067	0.625	0.170	0.005K	0.035
73/08/31	14 00		0.040	0.250	0.046	0.005K	0.010
73/10/01	09 00		0.046	0.100K	0.061	0.005K	
73/11/03	11 30		0.077	1.300	0.170	0.008	
73/12/08	08 45		0.112	1.000	0.088	0.005K	0.020
74/01/05	07 50		0.132	0.100K	0.008	0.005K	0.020
74/01/19	08 00		0.112	0.100K	0.030	0.005K	0.020
74/02/09	06 00		0.108	0.100K	0.012	0.005K	0.015
74/02/23	11 30		0.144	0.300	0.020	0.005K	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

3707E1 LS3707E1
35 01 31.0 084 07 00.0
NOTTELY RIVER
37 7.5 MURPHY NC
T/HIWASSEE LAKE
HWY 64 BRDG 5 MI SW OF MURPHY ON HWY 64
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 N02&N03 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	14 30		0.180	0.220	0.030	0.007	0.025
73/04/26	12 45		0.168	0.340	0.064	0.009	0.025
73/05/26	14 00		0.150	0.780	0.014	0.005K	0.040
73/06/26	19 00		0.189	0.945	0.040	0.005K	0.020
73/07/27	18 30		0.231	1.650	0.027	0.008	0.050
73/08/31	14 30		0.115	0.190K	0.044	0.005K	0.020
73/10/01	08 00		0.062	0.100K	0.067	0.010	
73/11/03	16 00		0.039	0.350	0.056	0.009	
73/12/04	08 00		0.160	0.300	0.052	0.005K	0.035
74/01/05	07 00		0.176	0.400	0.032	0.005K	0.025
74/01/14	06 30		0.156	0.100K	0.060	0.005K	0.035
74/02/04	07 00		0.200	0.800	0.088	0.005K	0.035
74/02/23	10 00		0.192	0.430	0.030	0.005	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

3707F1 LS3707F1
35 06 00.0 084 01 00.0
VALLY RIVER
37 7.5 MURPHY NC
T/HIWASSEE LAKE
RD HRUG LEAS TO MURPHY SCHOOL 1 MURPHY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	14 30		0.170	0.210	0.021	0.00K	0.020
73/04/26	11 55		0.154	0.330	0.056	0.006	0.035
73/05/25	17 22		0.160	0.660	0.600	0.005K	0.025
73/06/24	16 32		0.140	0.460	0.105	0.005K	0.030
73/07/28	09 15		0.140	0.250	0.046	0.005K	0.040
73/09/02	10 50		0.132	1.600	0.115	0.005K	0.025
73/10/01	14 00		0.140	0.150	0.018	0.012	
73/11/02	09 15		0.024	0.200	0.04K	0.009	
73/12/06	10 30		0.16K	0.300	0.024	0.00K	0.010
74/01/04	06 45		0.192	0.200	0.012	0.00K	0.060
74/01/19	05 26		0.224	0.100K	0.016	0.005K	0.025
74/02/09	08 30		0.168	0.100	0.010	0.005	0.025
74/02/23	09 56		0.156	0.10UK	0.010	0.005K	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/10/20

370761 L>370761
35 06 30.0 084 04 00.0
HANGING DOG CREEK
37 7.5 MURPHY NC
T/HI#ASSEE LAKE
RU(ST 13261BRUG 3.5 MI NW OF MURPHY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/03/24	13 00		0.046	0.210	0.026	0.016	0.016
73/04/24	11 20		0.100	0.280	0.020	0.005K	0.035
73/05/25	17 55		0.012	1.150	0.430	0.005K	0.010
73/06/24	17 20		0.021	0.720	0.410	0.005K	0.010
73/07/24	09 46		0.010K	2.520	0.227	0.005K	0.015
73/09/02	11 23		0.010K	0.400	0.033	0.005K	0.010
73/10/01			0.189	0.950	0.033	0.007	
73/11/02	10 07		0.069	0.350	0.132	0.005K	
73/12/04	13 30		0.100	0.100K	0.020	0.005K	0.005K
74/01/04	07 36		0.024	0.100K	0.005K	0.005K	0.015
74/01/19	07 36		0.020	0.100K	0.016	0.005K	0.005
74/02/04	10 52		0.024	0.100K	0.010	0.010	0.010
74/02/23	11 05		0.024	0.100K	0.010	0.005K	0.015

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 73/10/20

3707AA EA3707AA P002500
35 05 30.0 084 02 30.0
MURPHY NC
37057 7.5 MURPHY
D/HIWASSEE LAKE
HIWASSEE RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/10/11 CP(I)- 73/10/11	09 00 16 30		14.800	0.750	0.330	7.200	7.700	0.170	0.160